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ABSTRACT

This manual gives descriptions of and methods for control of diseases and insect pests of ornamental plants, weeds, and diseases and insect pests of turf plants. Included are diseases caused by fungi such as cankers, leaf galls, and rust; diseases caused by bacteria such as bacterial blight and crown gall; and diseases caused by nematodes and viruses. Also included are insects with sucking mouthparts such as aphids, lacebugs, and mealybugs; and insects with chewing mouthparts such as beetles and caterpillars. Ornamental and turf weeds are covered including both annuals and perennials. Eight kinds of turf diseases and nine kinds of turf insects are included. The manual concludes with a discussion of phytotoxicity, pesticide hazard to the environment, and safety tips. (BB)

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ORNAMENTAL AND TURF PEST CONTROL

This manual was developed in cooperation with the Georgia Department of Agriculture.

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SE 024 705

This training manual is intended to provide you with the information you will need to meet the standards of the Environmental Protection Agency for pesticide certification, and prepare you to take an examination given by the State Department of Agriculture based on this manual. It is not intended that this training will provide you with all the information you need for effective ornamental and turf pest control. Additional information in the form of publications and short courses can be obtained from the Cooperative Extension Service.

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ORNAMENTAL AND TURF PEST AND PESTICIDE SAFETY INFORMATION

Identification or recognition of pests is essential to proper pesticide application. Knowledge of potentially hazardous application techniques is also important. The commercial pesticide applicator in the ornamental and turf category must understand potential pesticide toxicity because of the proximity of the public to the application site.

Ornamental Disease Information

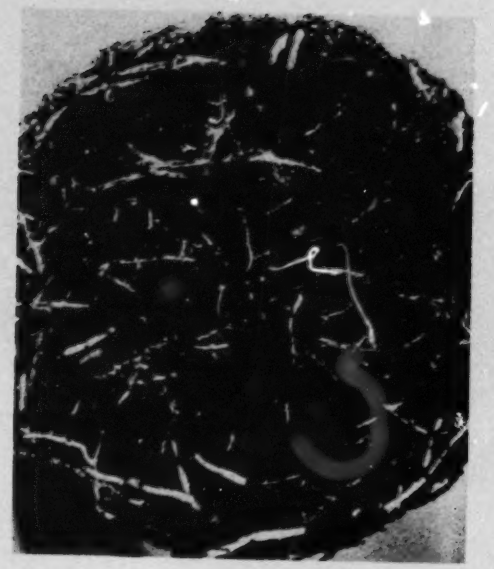
Plant diseases are more difficult to diagnose and control due to the size of the pathogenic organisms involved. All the plant pathogens discussed in the ornamental and turf disease section are microscopic in size. Nematodes may be 1/50 of an inch long or smaller, while fungi and bacteria may be even smaller. Because of the size of the organisms involved, disease diagnosis requires the identification of symptoms or the reaction of plants affected by these organisms. These symptoms may include leaf spotting, mottling, chlorosis, cankers, galls on roots and stems, and discoloration of roots.

There are environmental conditions which may also simulate plant diseases so they must be distinguished from actual pathogens. Such things as frost injury, dog urine burn, and nutrient deficiencies are not corrected by pesticide applications.

Unless the pathogenic organism is known, the chemical or cultural practice used to control the symptom may not work. Identifying a root problem as a root rot when it is actually a nematode problem will not be cured by applying a fungicide--a nematicide is required. The following information will classify the kinds of symptoms produced by plants attacked by these various organisms.

Diseases Caused by Fungi

ROOT ROT



Root rot is a common disease problem of all ornamentals. Its first symptoms generally appear on the above-ground parts as a gradual loss of vigor, yellowing of leaves or wilting. Attempts to correct the problem with fertilizers and water generally yield little or no response. Diseased roots appear decayed, generally brown to black, and may be mushy or spongy. Common root rotting organisms are the fungi Pythium and Phytophthora. These fungi normally inhabit soil everywhere. Excess moisture is always essential on virtually all ornamental plants.

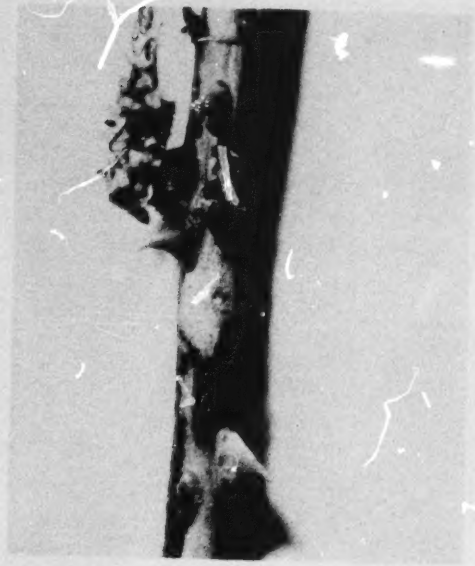
STEM ROT

The pathogen most commonly associated with stem rot of ornamentals, especially flowering ones, is Rhizoctonia. It is a common soil-inhabiting fungus which moves with the soil, in infected plant debris, or on cuttings.

Affected plants may first wilt during the day, then recover at night. However, the wilting symptoms increase in severity. In addition, the stem may be brown and sunken at the soil line. Under extremely moist conditions, brown mycelium may be visible on the surface of the stem. Chrysanthemums,

petunias, and other herbaceous ornamental plants are quite susceptible to stem rot.

CANKERS



A number of fungi cause cankers. Pathogens generally enter through wounds. Cankers begin as small, discolored yellow or red spots which sometime appear water-soaked. These spots enlarge and their centers may become tan or gray. Eventually small, black specks may form in the center of each spot. Cankers can enlarge and girdle the stem, causing death to the above plant parts. Rose canker is a common example of this symptom.

LEAF SPOTS

Fungal leaf spots may first appear as dark brown, pinhead-sized spots with or without a yellow halo. Spots may enlarge to cover an entire leaf. As the spots become more abundant, leaves may yellow, die, and drop. Leaf spots usually first occur on the lower leaves and progress up the plant. Small, black structures the size of pinheads may be found in the center of many leaf spots.

Leaf spots are more common in the early spring and fall, and may be destructive over a wide range of temperatures. Usually an abundance of

water is necessary for infection. When infected leaves fall and become part of the refuse around a plant, spores are produced and splashed to healthy plants under appropriate environmental conditions. Spores may also be blown and carried on clothing and tools to healthy plants. Leaf spots occur on virtually all ornamental plants.

RUST

Rust is a common name for a group of diseases caused by fungi. These diseases have very complicated life cycles and in most cases require two separate hosts to complete their life cycle. In many cases removing either one of the hosts can break the cycle and stop rust. Spores may be splashed or windblown to leaves or stems where they attach themselves and grow into tissue. Once inside the leaf, the fungus begins to form large numbers of spores. As this number increases, pressure builds and finally the surface of the leaf is ruptured, releasing the spores. They are then blown to other plants or to the alternate host where infection occurs. Foliage spots may be on the upper and/or lower leaf surface. These spots are brown, reddish-brown, orange, or yellow. In many cases rubbing the affected leaf surface will leave an orange color on the fingers. Cedar-apple rust is probably the most common form of rust found today.

POWDERY MILDEW

The white, fluffy growth produced on the surface of ornamental leaves, stems, and occasionally fowers has given this disease its name, "powdery mildew." Fungus spores are produced from overwintering structures on the

previous season's leaves. They are windblown or splashed to healthy plants which they infect. Under moist, warm to cool conditions, the disease may appear overnight and be widespread. Plants affected by powdery mildew may show crooked stems, bubbled and curled leaves. Late in the growing season as average temperatures begin to decline, the fungus produces small, black, overwintering structures which can withstand the cold winter. Roses, zinnias, and euonymous are just three examples of the many plants commonly affected by powdery mildew.

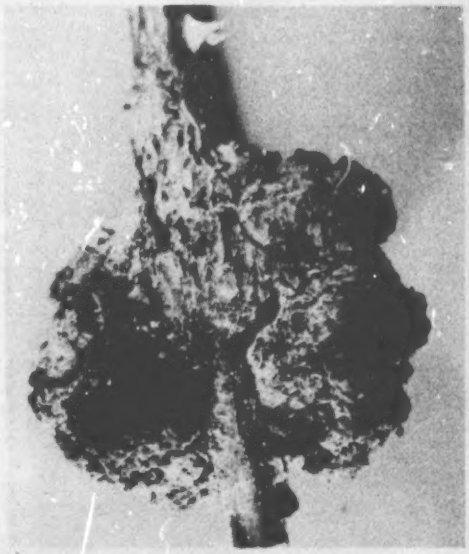
LEAF GALLS

Leaf galls are common, troublesome diseases caused by fungi and favored by cool, moist weather. Leaf galls can usually be seen shortly after new growth begins in the spring (from mid-March to mid-May). The disease is seldom a problem in dry springs and sunny locations. All or any part of individual leaves may be affected. Part of the leaf becomes distorted with a pale green to whitish colored, bladder-like thickening. The young, thickened, fleshy-like leaf is covered with a white growth. As the galls age they turn brown, dry up, and fall to the ground. If the disease is severe, plant vigor can be affected due to loss of leaves.

The dead, dry leaves which have fallen to the ground will act as a source of spores for infection the following season. Leaf gall of azalea and camellia is the most common example of this disease.

Diseases Caused by Bacteria

CROWN GALL



Crown gall first appears as a soft swelling of the roots or stem. As the disease develops, the swelling enlarges--becoming firmer and darker. The outer surface of the gall may become rough. Laboratory isolation may be necessary for a definite diagnosis.

Crown gall bacteria may survive in the soil for two years as slowly decomposing galls from a previous crop. The bacteria enter the plant only through wounds and natural openings. Once inside, normal cell development of the plant is altered. After galls have fully developed, they begin to decompose and release additional bacteria which can re-infect the plant. Euonymous and rose are probably the most frequently observed hosts of crown gall.

BACTERIAL LEAF SPOT

Bacterial leaf spot may begin as a light green, water-soaked area. Later, the spots may turn brown to black. Spots generally appear more irregular in shape than fungal leaf spots. The bacterium can enter the water-conducting system of some plants

and cause stem and/or root diseases. Under warm, moist conditions the leaf spot will appear soft and mushy. However, under dry conditions the same spot may be brittle.

The bacterium generally overwinters in plant debris and is introduced to the plant in splashing rain or in watering. Bacteria do not enter the plant directly, but require either plant injury or a natural plant opening for entrance. Once the bacterium enters the plant and multiplies causing symptoms, leaves may fall prematurely. Such leaves act as a source of bacteria the following year. This disease occurs annually on ivy in the Southeast.

BACTERIAL BLIGHT

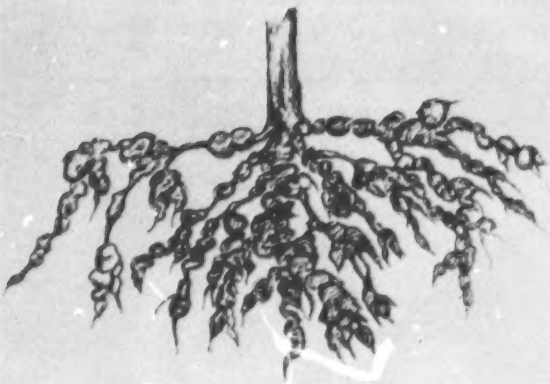
Fire blight is perhaps the most common bacterial blight, affecting a large number of woody plants. It is commonly found on flowering crabapple and pyracantha.

Infection generally occurs in the spring and may be heavier during long periods of cool, wet weather. The bacterium overwinters on stems and in bud scales. It is also transported by bees in the pollination process so symptoms may occur on blossoms and fruit spurs.

Symptoms first appear on new shoots as a dark discoloration as if scorched by fire. Later, the branch may show signs of a discolored, sunker canker. Entire plants may be killed.

Diseases Caused by Nematodes

NEMATODES



Nematodes are microscopic worms which live in the soil and feed on plant roots. Some nematodes cause small swellings on roots; others may not cause swelling but simply kill the tips of feeder roots. The above-ground symptoms of nematode damage may include yellowing of foliage or stunting and a general decline of the plant. It is difficult to distinguish between the symptoms of nematode damage and root rot infection. Laboratory analysis of soil from the affected plant is essential for a definite diagnosis. Root-knot of boxwood is an example of a nematode disease of ornamentals.

Diseases Caused by Viruses

VIRUSES

Viruses in ornamentals primarily produce symptoms such as chlorosis, mottling, ring spots, and occasionally dying tissue. Infection occurs by insects or mechanical means. Insects feeding on the plants can transmit viruses. These pathogens can also be carried on pruning equipment. Plants grown from cuttings are more susceptible to virus diseases. At this time no

chemical is cleared for virus control on ornamentals. Camellias and roses are examples of plants commonly attacked by viruses.

Ornamental Insect Information

Because of the wide diversity of ornamental plants, there is a large number of insect pests that may require control. You cannot possibly identify all of the insects you will encounter so you will need the assistance of your County Agricultural Extension Agent, Extension Entomologists, and others. However, there are certain kinds of insects that attack a large number of plants and, therefore, should be recognized by the commercial pesticide applicator.

Pests of ornamentals may be divided into two groups by the way they feed: (1) insects with sucking mouthparts (i.e. aphids, scales, mealybugs, whiteflies, lacebugs, thrips, and mites) and (2) insects with chewing mouthparts (i.e. grasshoppers, beetles, sawflies, and caterpillars).

Damage by pests with sucking mouthparts is basically similar in that the beaklike mouthparts are used to pierce the plant tissue and suck the plant juices. Damaged foliage is usually mottled. Plants may eventually wilt due to excessive loss of plant juices.

Damage by pests with chewing mouthparts is basically similar in that portions of the plant are bitten off and consumed. The insects may feed on leaves, flowers, stems, or roots.

Insects with Sucking Mouthparts

APHIDS

Aphids or "plant lice" are small, soft-bodied insects. Their color varies from green to reddish to black. They usually cluster on the underside of leaves and on stems where they

suck sap from young, tender growth. Infestations often build up quickly. Aphids are a common pest of roses.

SCALES

During most of their life scale insects are soft-bodied, legless, motionless, and covered with a shell. They may be circular, oval, oblong, or pear-shaped.

Scale insects develop from eggs which are laid underneath the shell. The newly hatched insects ("crawlers") move about over the plant until they locate succulent new growth. They insert their sucking mouthparts into the plant and begin to form their shells.

Scale insects are much easier to control when young, especially when in the "crawler" stage. Scale egg-hatch is generally closely associated with the flush of new growth in the spring. For scale control in general, apply an approved insecticide as soon as the new growth hardens followed by an additional application two to three weeks later. Camellias and hollies are commonly attacked by scales.

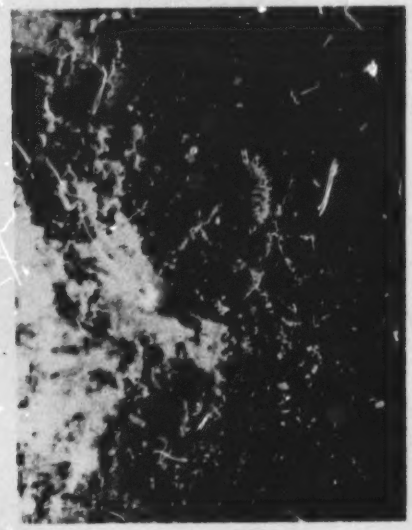
MEALYBUGS

Mealybugs are soft-bodied insects which are usually covered with powdery or cottony, wax-like material and may resemble scale insects. However, mealybugs are able to move about throughout their lives. Mealybugs may be found feeding on azalea plants.

WHITEFLIES

Whiteflies are very small, white insects which resemble miniature

moths. The young, which infest the underside of leaves, are circular, flat, almost translucent, and very difficult to detect. Whiteflies are common pests of gardenias.

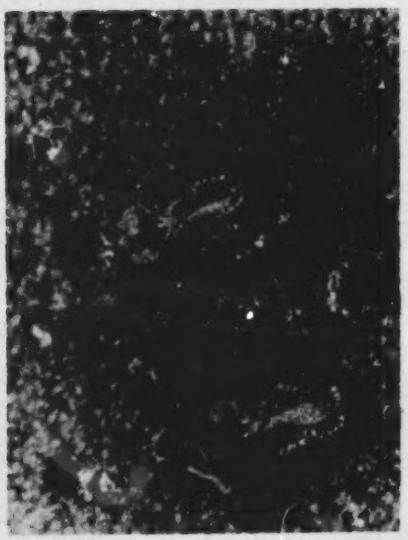


(MEALYBUG)

(WHITEFLIES)

LACEBUGS

Lacebugs are small, broad, flat insects. Their bodies are usually brown and the wings are clear with a fine lace-like appearance. Immature lacebugs are wingless and covered with spines. Damage appears as a whitish speckling on top of the leaf, and is caused by these insects feeding on the underside of the leaf. The presence of brown or black spots of excrement on the underside of foliage is evidence of a lacebug infestation. Lacebugs may be found on pyracantha.



THRIPS

Thrips are minute, slender insects with rasping-sucking mouthparts. Some are primarily foliage feeders while other species are bloom feeders.

A generation is normally completed in about two weeks, and in warm climates thrips breed all year long. Thrips injury to flowers, such as those of roses and gladioli, is common.

MITES

Mites are not true insects but are tiny, eight-legged animals that are closely related to spiders and ticks. Many are so small that they cannot be detected without the use of a land lens or magnifying glass. They vary widely in color.

Mite damage frequently appears as bronzing on the foliage which sometimes gives it a dusty appearance. A thin webbing in which mites may be seen may be associated with some mite infestations.

Holly and azalea plants are common hosts for mite infestations.

(THRIP)

(MITES)

Insects with Chewing Mouthparts

GRASSHOPPERS

Grasshoppers in general are relatively large in comparison to the insects described in the previous section. These insects occasionally consume large quantities of ornamental foliage. Grasshoppers should be

controlled before they become numerous. Although grasshopper infestations large enough to cause serious plant problems are sporadic, they can occur on any type of plant.

(GRASSHOPPER)

(BEETLE)

BEETLES

Beetles vary considerably in habits, size, and appearance. One of their most distinctive features is the wing structure. Most beetles have four wings with the front pair thickened, leathery, or hard and shell-like.

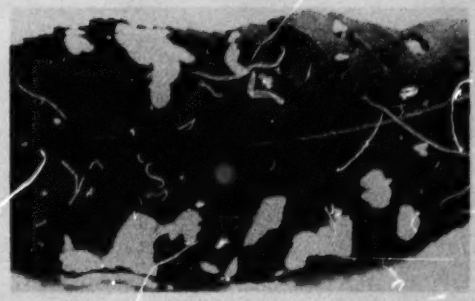
Beetles may devour various parts of plants. Some are leaf feeders while others feed in flowers. Some feed at night and hide beneath the plant during the day, while many feed during the day. Various species of beetles attack all ornamental plants. However, roses and azaleas are most frequently attacked.

The larvae of most beetles are also destructive. Some feed on the foliage, but many feed on roots or bore through stems and branches.

SAWFLIES

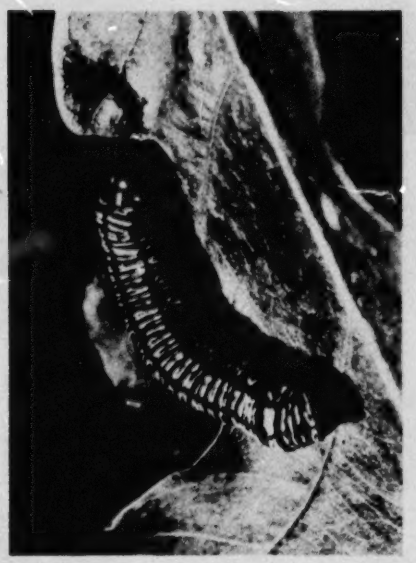
Sawflies are members of that group of insects which includes bees and wasps. They are not members of the group of true flies as the name might imply. Sawflies can be a pest on any flowering ornamental.

The larvae of the majority of sawflies are external feeders on foliage and resemble caterpillars. But they differ from the caterpillars of butterflies and moths in that sawfly larvae have more than 10 soft, fleshy legs. Butterfly and moth caterpillars have six jointed legs near the front of the body.



The larvae of a few species bore in the stems, fruit, wood, or leaves (leaf miners). The soft, fleshy legs are usually absent on these borers.

CATERPILLARS



Caterpillars may range in size from minute to five inches in length. They may be fuzzy or naked and armed with spines or smooth-bodied. Caterpillars are often pests on plants such as azaleas.

They devour the foliage primarily, leaving holes and irregular areas, or they may even strip leaves entirely. Some feed as individuals, others feed in groups or colonies. Some feed unprotected by any type of shelter; others construct silken webs and tie leaves together or roll them to provide a protective covering.

Hand removal is effective when only a few caterpillars are present. When infestations are severe, a single application of an approved insecticide will usually provide control.

Ornamental Weed Information

Various types of weeds present some special problems regarding the production and maintenance of ornamental trees, shrubs, and plantings. Weeds can be divided into (a) annuals and (b) perennials. They require somewhat different approaches for control and, therefore, present various problems in the degree of hazard due to chemical application. All weed control efforts in an ornamental situation must be selective since the intent is to remove the undesirable species which is growing in close proximity to a desirable species.

ANNUALS

CHICKWEEDS

There are several so called chickweeds which are either annual or perennial in nature. The chickweeds generally prefer soils with high nitrogen content. They can persist at all seasons of the year--in cool spots during summer and everywhere in winter. These plants can produce a great quantity of seeds and occupy very large areas as single plants.

CRABGRASS

There are several species of this very common weed, which probably has the widest range of any plant. It is a summer annual which begins to produce seed in mid-summer, continuing throughout most of the late summer and early fall. Crabgrass usually dies at the first frost.

GOOSEGRASS

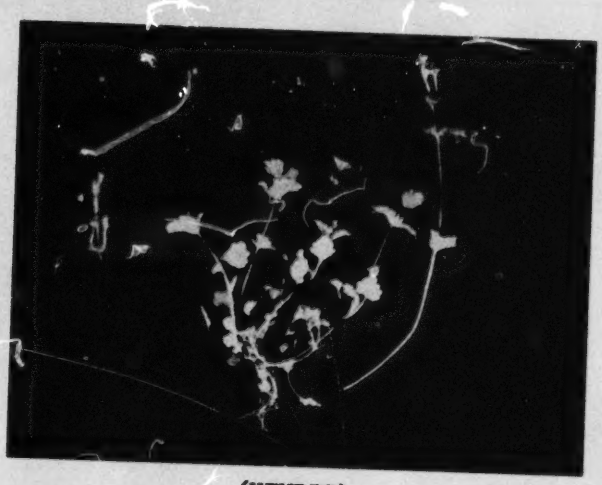
Goosegrass occurs in the same general areas as crabgrass, but is somewhat stronger in competition with ornamentals. Once established, the plants are very difficult to remove and are tolerant to many of the chemical weed killers. Another common name for this plant is "silver crabgrass."

(CRABGRASS)

(GOOSEGRASS)

HENBIT

This member of the mint family is a very common annual winter weed. It is characterized by the square or four-angled stem, leaves in a whorl, and clusters of small purple flowers in the leaf axils. Under high fertility conditions, growth can be quite rank (up to 10-12 inches tall), which can offer serious competition to some ornamental plantings.



(HENBIT)

(SPURGES)

SPURGES

These plants are generally annual in nature, producing rather large numbers of seed. When broken, the plants exude a milky juice which is an irritant to some individuals. Spurges can usually be identified by the milky juice and the peculiar leaf shape which is frequently dotted with a purple marking.

PERENNIALS

COMMON BERMUDAGRASS

Common bermudagrass is a weed which is perennial in nature. It propagates by seed, stolons, and rhizomes. It is further classified as a creeping perennial which means that it runs and often spreads from turf areas into ornamental plantings.

BUTTONWEED

This plant is a persistent pest of ornamentals and may also infest turf areas. Buttonweed has the capability to grow under close mowing conditions where it will stand less than an inch tall. It will also grow two to three feet high in dense ornamental plantings. Seeds are covered by a hard coat which aids in the distribution of this plant in ornamental areas.

(BUTTONWEED)

(COMMON BERMUDAGRASS)

(DICHONDRA)

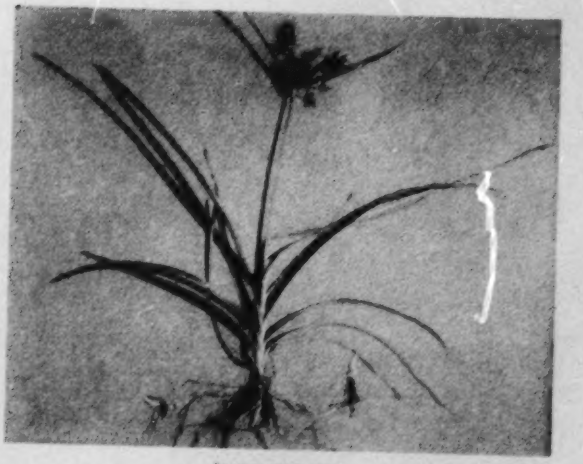
DICHONDRA

Dichondra, also known as Pennywort, is a member of the morning-glory family. Although it has a vining habit, it grows in a prostrate manner on the soil surface in turf and ornamental areas.

FLORIDA BETONY

This plant is commonly moved as seed or tubers from one location to another in new ornamental plant materials from nurseries. Other common names for this plant are rattlesnake weed and Chinese artichoke. The former name is assigned due to the ring constrictions on the tubers. Florida betony may infest both ornamental and turf plantings.

(FLORIDA BETONY)



(NUTSEDGE)

NUTSEDGE

Nutsedges are among the most troublesome weeds in ornamental plantings. The primary species is purple nutsedge, a perennial plant which produces tubers. The life cycle from a nutsedge tuber through vegetative development, seed production, and the formation of new tubers may be accomplished in as few as eight weeks. Once nutsedge plants become established in ornamental plantings, they are exceedingly difficult to selectively remove.

Turf Disease Information

Like the pathogens (fungi, bacteria, nematodes, and viruses) which harm ornamental plants, pathogens of turfgrasses are also quite small. Although all four types of pathogens attack ornamentals, only two turf pathogens (fungi and nematodes) are of significant importance in Georgia. To determine which pathogen is causing a disease, observation of symptoms is the best method of identification. The following information will explain the identification and biology of some common turf diseases.

BROWN PATCH

(BROWN PATCH)

Brown patch is a common fungal disease of bermuda, centipede, rye, bahia, bent, St. Augustine, and zoysia grasses. It is the most common turf pathogen, being responsible for more than half of the homeowner's lawn disease problems.

Brown patch develops most readily at temperatures between 80-85°F. In addition to ideal temperatures and humid weather, heavy applications of nitrogen fertilizer favor disease development. Brown patch is characterized by roughly circular areas which may be a few inches to several feet in diameter. Affected areas are generally brownish in bermudas, zoysia, centipede, bent, and ryegrass. Affected St. Augustinegrass is usually straw-colored.

DOLLAR SPOT

Dollar spot affects a wide variety of grasses including bermuda,

centipede, rye, bahia, St. Augustine, zoysia, fescue, and bentgrass. The fungus is active throughout the growing season, especially when there is low soil moisture and an excess of dew or fog. Dollar spot usually causes very little damage on a properly fertilized lawn. The disease is characterized by small spots, one to two inches in diameter. Large numbers of spots can come together and form a larger dead area. Leaf spots are usually found along the edge of the grass blade and may fuse across the blade, causing the tip to die.

(DOLLAR SPOT)

(COTTONY BLIGHT)

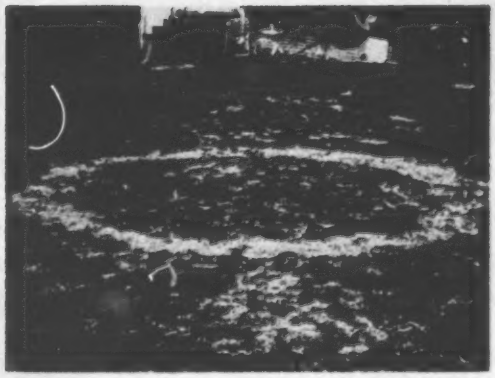
COTTONY BLIGHT

Cottony blight is caused by a number of species of the fungus Pythium. The fungus attacks bermuda, rye, bent, blue, fescue, and zoysia grasses. Cool season grasses are especially susceptible to this disease. Conditions which favor cottony blight are an abundance of moisture and poor air circulation. The disease is most active above 68°F, especially between 90-95°F.

HELMINTHOSPORIUM DISEASE

Leaf spot or Helminthosporium leaf spot is a common foliage problem of bermuda, centipede, St. Augustine, rye, blue, and fescue. From a distance, leaf spot affected areas appear chlorotic or yellowed. Spots on the leaves are dark margined with tan centers. Many hybrid bermudas are resistant to leaf spot when maintained at adequate levels of nitrogen and potassium. Ryegrasses are generally most susceptible.

MUSHROOM FAIRY RING



Fairy ring can occur in any turf. It appears as a circular discoloration of grass from several inches to many yards in diameter. Mushrooms (toadstools) may appear in a ring during warm, moist periods. Grass growing in the ring is generally a darker green than the surrounding grass. However, during periods of moisture stress the grass in the ring may die. This

general decline of grass in the ring adds to the unsightliness of the fairy ring problem.

SLIME MOLD

Slime molds are commonly found on Georgia lawns in warm, moist weather. This fungal growth on grass leaves may be either a small, crust-like, light to dark gray mass with a sooty appearance or a tan to orange shapeless mass. The fungus causing this unsightly problem does not infect the grass blade but simply uses it for support. The only effect which it has on the "plant process" is to reduce the surface area of the grass blade, which can be used for food production, by shading.

RUST

Rust is a problem on rye, blue, fescue, zoysia, St. Augustine, and bermudagrass. Rust spores are blown to the plant from warmer climates or alternate hosts. These spores attach themselves and infect the plant. After infection, large numbers of spores are produced under the leaf surface. Pressure produced by the increasing number of spores builds up until the leaf surface is ruptured. This releases spores which are blown

about or moved mechanically on mower blades, feet, etc. to healthy grass blades where infection occurs. The disease is most frequently found during mild, humid weather.

NEMATODES

Nematodes weaken and reduce the vigor of turfgrasses by restricting the development of the root system. The symptoms of nematode injury may be confused with nutritional problems, insufficient water, hardpan, or any factor which restricts root development. Symptoms commonly associated with nematode injury include thinning to completely killed areas, pale green to chlorotic color, excessive wilting during drought stress, poor response to fertilization, and a greater weed problem due to sparser grass. The intensity of the symptoms observed will vary with the grass variety, kinds of nematodes present, the nematode population level, and the fertilization-watering program being practiced. The most reliable method for determining whether or not a nematode problem exists is by means of a soil assay

Turf Insect Information

Many insects and related animals are often found damaging or associated with damaged turfgrasses. Some pests feed on grass blades and stems, while others feed only on roots. The following information concerns the biology and identification of the most commonly found pests on turfgrass.

ARMYWORMS

Armyworms are caterpillars of moths. They are greenish when small

and usually dark brown when fully grown. Several stripes usually extend from the head end to the rear end.

Armyworms feed on the grass blades. Damaged turf appears ragged. When numerous, they may devour the grass down to the ground. Caterpillars pupate in the soil. The moths emerge within a few weeks.

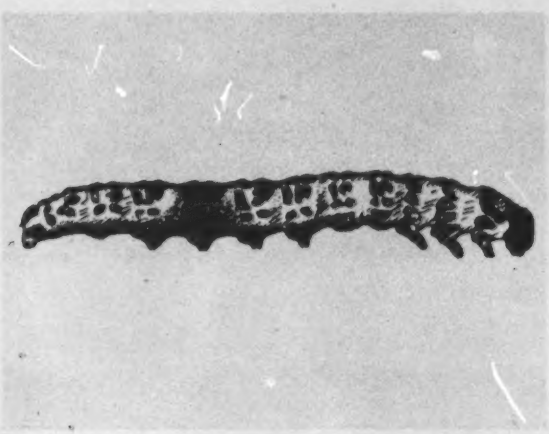
CUTWORMS

Cutworms feed at night and usually completely sever foliage or stems. During the day these dull brown, gray, or nearly black, plump, greasy caterpillars usually remain below ground under clods or other shelters. They are usually curled up in a circle.

SOD WEBWORMS

These light brown, finely haired caterpillars feed only at night. Damaged grass blades appear notched on sides and ragged. Sod webworms prefer new lawns. Irregular brown spots are the first signs of damage. Large areas of grass may be damaged severely or destroyed in only a few days if the infestation is heavy.

(CUTWORM)



(SOD WEBWORM)

GROUND PEARLS

These scale insects suck juices from the underground parts of grasses. The nymph covers itself with a hard, spherical, usually yellowish-purple shell that looks like a tiny pearl. Centipede is most commonly attacked, but other grasses are subject to attack. Severely infested grass turns yellow, then brown.

BILLBUGS

Adult billbugs have a pair of jaws at the tip of a long snout or "bill." They are usually reddish-brown to black. The young are white, legless grubs.

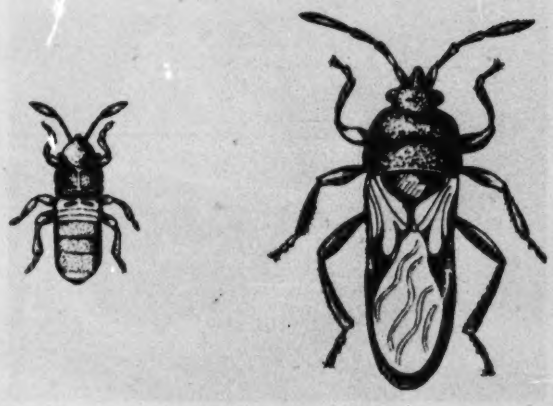
Adults lay eggs near the crown of the plant. The grubs feed on roots and underground runners. Adult billbugs burrow in the grass stems near the soil surface and also feed on the leaves.

Zoysiagrass and bermudagrass are most often injured, but feeding may occur on many grasses. The roots of damaged grass are destroyed, and the grass is killed in irregular patches.

CHINCH BUGS

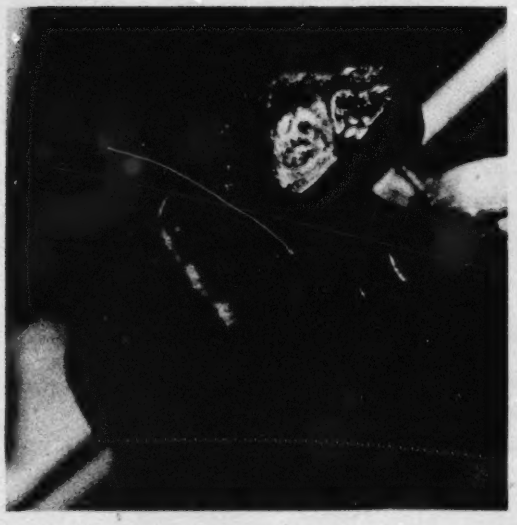
Adults are black with white patches on the wings which are carried

folded over the back. Immature chinch bugs are reddish with a white band across the back when young, but they become black as they near adult size.



The bugs insert a slender beak into the grass and suck the plant juices. Typical injury appears as a patch with a brown, dead center and yellowish margins. St. Augustinegrass is the most seriously injured grass, but other lawn grasses are subject to attack.

SPITTLEBUGS



Adults of the spittlebug, which is a lawn pest in Georgia, are dark brown or black and have two orange stripes across their wings.

The ivory-colored, brown-headed nymphs live inside masses of spittle or froth. The masses are found just below the soil surface to a few inches above the soil surface. Nymphs suck juices from the plants.

MOLE CRICKETS

Mole crickets are light brown with short, stout forelegs and spade-like feet. They make small, raised trails as they burrow just under the soil surface feeding on the roots. The burrowing loosens the soil and

causes it to dry out quickly, also resulting in death to damaged plants.

(MOLE CRICKET)

(WHITE GRUB)

WHITE GRUBS

White grubs are fat and lie in a C-shaped position. They are whitish with dark areas near the rear. They have a distinct head which is usually brown. They are known as beetles at maturity.

The grubs feed on underground plant parts. In heavy infestations the roots are pruned off to the extent that the turf mat can be rolled back like a carpet.

Turf Weed Information

The definition of a weed is "a plant out of place." By this definition any member of the plant kingdom may be called a weed. Weeds present some rather special problems in the production and maintenance of high quality turf. Certain grasses and broadleaf weeds which are permitted to grow in turf tend to reduce its aesthetic value. Herbicides must be chosen with considerable care to prevent possible injury to turf species and to avoid hazards to people and the environment.

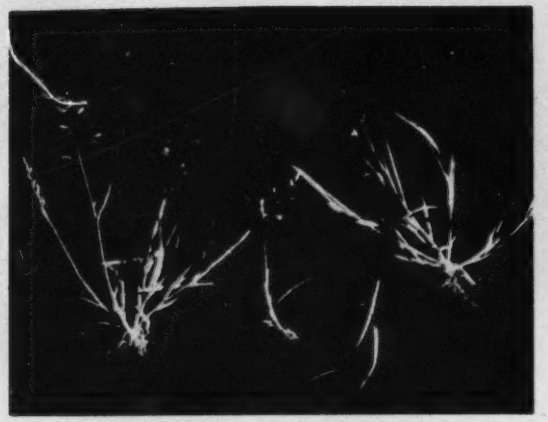
Turf is developed and produced for aesthetic and recreational enjoyment by man. It is part of the home landscape and children, adults, and

household pets are exposed by intimate contact to pesticides used in turf maintenance. Man is similarly exposed to potential hazards through activities conducted on recreational turf areas. As with weeds of ornamentals, turf weeds can be divided into two categories of (a) annuals and (b) perennials.

ANNUALS

ANNUAL BLUEGRASS

This plant is often called by its botanical name, Poa annua. It is a winter annual which occurs in turf areas throughout the state. It was probably introduced many years ago in winter annual overseeding mixtures. It is characterized by a boat or keel-shaped leaf tip, a bright green color, a short growing habit (usually not more than three to four inches tall), and the presence of many seed heads which give it a silvery appearance during April and May. The plant usually germinates in late August or early September, and additional plants may emerge during warm periods during the winter or early spring. Hot summer temperatures usually cause the plant to disappear from turf areas by late May or early June.



(ANNUAL BLUEGRASS)

(COMMON LESPEDEZA)

COMMON LESPEDEZA

This is a common summer annual, which primarily infests turf such as centipede and St. Augustine grasses. Lespedeza can usually be distinguished from other small-leaved legumes by the presence of striations or lines on the underside of the leaf. Single plants can occupy rather large areas in turf and persist under close mowing.

CRABGRASS

This weed is common to turf areas everywhere. There are several species which may occur in turf. The predominant one is large crabgrass, a summer annual, which produces seed from mid-summer to early fall. Crabgrass generally emerges as a weed in turf areas from mid-March through late May. See page 16 for a picture of crabgrass.

GOOSEGRASS

This weed is almost as common as crabgrass throughout the southeastern region. It germinates somewhat later in the season than crabgrass, requiring the warmer temperatures of mid to late May for germination. Another common name is silver crabgrass. See page 16 for a picture of goosegrass.

SPURGES

These weeds are annual in nature, appearing each year from seeds produced the previous year. Their growth habit in turf areas is prostrate. The weed occurs most frequently in areas with heavy traffic. Spurges are generally recognized by their purple coloration, the exudation of milky juices when the stem is broken, and purple leaf markings in the center of each leaf. See page 17 for a picture of spurges.

SPURWEED

This plant is a member of the composite family, and is tolerant to a number of chemical weed killers. It is an especially undesirable pest of fine turf because each flower produces a single seed tipped with a sharp spine, and these clusters become spiney upon maturity.

(SPURWEED)

(BAHIAGRASS)

PERENNIALS

BAHIAGRASS

This plant is a pasture grass which produces seed in large numbers that are readily spread to turf areas. Bahiagrass can become a serious problem in centipede or St. Augustine grasses due to the absence of truly selective chemicals for removal. The most undesirable feature for bahiagrass in turfgrass areas is the production of a tall seed stalk which regrows within a few days after each mowing.

COMMON BERMUDAGRASS

Common bermudagrass is often used as a desirable turfgrass. But it may become a serious pest in areas of fine-leaved turf. Common bermudagrass is spread by seed; it also reproduces by stolons and rhizomes. See page 18 for a picture of this plant.

NUTSEDGES

A common weed in turf areas is purple nutsedge, a plant which can complete its life cycle in about eight weeks. During this time it goes from a tuber through seed production to production of new tubers. It is very difficult to selectively remove nutsedge once it becomes established.

Nutsedges are characterized by the presence of three ranked leaves, which are usually very shiny on the upper surface. See page 19 for a picture.

WILD GARLIC

This plant is commonly referred to as wild onion. It is classified as an annual or a perennial, but behaves primarily as a perennial. Germination of dormant bulbs occurs in late summer or early fall as soon as temperatures begin to diminish. New plants will continue to emerge during warm periods throughout the winter. In turf areas a primary means of reproduction is by production of underground or side bulbs which leads to the development of rather large or dense clumps of wild garlic.

POTENTIAL PHYTOTOXICITY

Phytotoxicity, or pesticide damage to plants, results in such things as abnormal growth, leaf drop, and discolored, curled, and spotted leaves. If phytotoxicity is severe, the plant may die. Phytotoxicity often mimics such things as insect damage, plant disease, and response to poor growing conditions such as insufficient moisture, improper fertilization, etc. The following items are especially relevant to the phytotoxicity problem:

1. A wide variety of plant material
2. Pesticide drift
3. Pesticide persistence beyond the intended period of pest control.

A. Wide Variety of Plant Material

Ornamental plants vary from herbaceous to semi-woody and distinctly woody species. Generally, herbaceous plants (chrysanthemums, petunias, turfgrasses, etc.) are more susceptible to pesticide damage than woody ones. Even the woody plants are more susceptible when growth is young and tender. Greenhouses present a special problem as phytotoxic vapors tend to be trapped in the closed environment.

Plant damage is more likely to occur with herbicides. Fungicides except those applied as smokes tend to be less hazardous to plants than herbicides and insecticides. The pesticide label is the best guide to the safe use of pesticides on a specific ornamental plant. If the pesticide is not known to be safe for use on a specific ornamental plant, it should not be used. Where different plants are rotated in the same soil, a pesticide used to control some pests on one plant may leave residues in the soil that will damage or kill another plant. This is especially true of some herbicides.

Warm season turfgrasses include the bermudagrasses, zoysiagrasses, St. Augustinegrass, and centipedegrass as well as some varieties which have been developed from these species. Cool season species include such plants as the bluegrasses and fescues. Some herbicides used to control weeds in warm season grasses will damage or destroy cool season grasses. The pesticide label is the best guide as to whether the pesticide should be used on a specific turf species.

B. Drift Problems

The proximity of different plants with varying susceptibility to pesticide damage requires that commercial pesticide applicators in the ornamental and turf category be especially aware of drift problems. There are several steps that can be taken to prevent damage to non-target plants.

Drift can be prevented or minimized by using methods described in a later section. Pesticides should be selected that are safe for both target and non-target plants if possible. It may be necessary to place a barrier around the target plant or remove susceptible plants from the area (such as removing susceptible potted plants from a greenhouse). Finally, you may decide not to apply a pesticide to the target plant because the benefit does not justify the hazard to near-by plants.

C. Persistence Beyond the Intended Period of Control

The period of pesticide residual activity varies greatly from one class of pesticides to another. Persistence is directly related to rate of application, soil type or texture, temperature, moisture conditions, rainfall amounts, and other factors. Commercial applicators must be familiar with persistence of each pesticide which may be applied to ornamentals and turf, especially where adjacent areas may be affected, treated soil is used to grow other plants, or where humans and pets frequent the area. An example of persistence causing a problem in plant handling would

be the use of a highly toxic systemic insecticide on plants just before they are sold to the public. It is very possible that in the process of selecting a plant, the soil would be handled and the general public would be exposed to the active chemical. In situations such as this, it is necessary to hold the plants until the chemical has lost its toxicity. This information can be found on the label.

Persistence is an important part of pest control, since successful pest control requires a knowledge of the persistence period to make subsequent applications. For example, generally herbicides used for preemergence weed control in turf persist for 60 to 90 days; and postemergence herbicides last from one or two days to three or four weeks, depending upon the specific herbicide involved.

Persistence can be an advantage to the applicator for long term control of the pest. The use of a chemical to control Pythium (cottony blight) on turf or root rot on chrysanthemums is a situation in which pesticide persistence is desired. However, problems can develop when applications are made too frequently which raises the level of the chemical in the soil to potentially phytotoxic amounts.

MINIMIZE PESTICIDE HAZARDS TO THE ENVIRONMENT

Turf and ornamental pesticides must often be applied in environments frequented by humans, pets, and other domestic animals. The pesticide applicator must be constantly alert to the hazard associated with this situation. Primarily, the problem is twofold: (1) he must prevent hazardous amounts of pesticides from drifting into non-target areas, and (2) he must prevent humans, pets, and other domestic animals from contacting hazardous amounts of pesticides within the treated area. Many of the procedures used in protecting animals are equally applicable to preventing pesticide damage to desirable plants.

A. Preventing or Minimizing Drift

Where several pesticides are available, the applicator should strongly consider the hazard and toxicity of the active ingredient in making a choice. He should use formulations and methods of application that will result in minimum drift.

Air blast sprayers can be used in ornamental and turf pest control if very safe (toxicity to applicator and non-target plants is low) pesticides are used. Air blast sprayers hould never be used to apply herbicides.

Two types of drift are associated with pesticides. The most common, drift of spray droplets or dust particles, is directly affected by such things as spray pressure, nozzle opening size, wind velocity, and pesticide formulations. Drift of a chemical with low vapor pressure is termed "vapor drift." Vapors or gases can drift in harmful concentrations--even in the absence of wind. Fumigants, such as methyl bromide, must be confined so they will not drift from the treated area (proper sealing with a plastic tarp is essential). Some pesticide products are volatile or capable of vaporizing from soil and leaf surfaces in potentially harmful concentrations after application. Herbicide vapor can severely damage and even kill desirable plants.

B. Protecting Humans, Pets, and Domestic Animals from Hazardous Residues in the Treated Area

Before applying a pesticide, you should see that the application site is cleared of such things as toys, pet food dishes, bird feeders, and other articles. Pesticide residues on these articles can be a hazard.

Animals and humans should be kept from the area during pesticide application. (They should also be kept from the area of potential drift and run-off until the spray has dried or the dust has settled regardless of the toxicity of the pesticide used.) Some pesticides may be potentially

hazardous for a longer time, therefore, label directions concerning re-entry should be closely adhered to.

Recently sprayed ornamental plants with showy flowers or edible fruits present a special hazard because they are likely to be handled or even eaten by children.

* * *

SAFETY TIPS

1. Transport pesticides in truck beds--not in the driver's compartment. Do not transport pesticides, other than small packages of household pesticides, in the passenger compartment or trunk of a vehicle. Pesticide fumes can be dangerous and in case of an accident, the pesticide container may rupture and spill on the occupants.
2. Observe directions, restrictions, and precautions on pesticide labels. Failure to do so is not only dangerous or wasteful; it is also illegal.
3. Mix pesticide solutions in a well-ventilated area, preferably outside. Avoid inhaling pesticide sprays or dusts.
4. Use pesticides at correct dosages and intervals to avoid excessive residues and injury to plants and animals.
5. Apply pesticides carefully to avoid drift especially where water supplies, vegetable gardens, or fruit trees are nearby.
6. Proper safety equipment and needed protective devices should be used. While these devices may be available, they serve no purpose unless used.
7. Never smoke, drink, or eat while handling or applying pesticides.
8. Store all pesticides behind locked doors in original containers with labels intact.
9. Dispose of surplus pesticide containers so that contamination of water and other hazards will not occur.

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